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A63B 53/04

(52) UK CL (Edition L)
A6D D23B

(56) Documents cited
GB 2181657 A GB 2132902 A US 5004242 A
US 4809978 A US 4768787 A US 4754975 A
US 4664383 A

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UK CL (Edition K) A6D D23B
INT CL[5] A63B 53/04
Online databases: WPI

(54) Golf club heads

(57) In a set of golf iron heads, multi-component golf iron heads are provided in which at least part of the striking face area of the head comprises at least one face-piece component which has characteristics different from the rest of the head: for example (a) of material selected for its surface friction and/or flexural modulus characteristics affecting the spin behaviour of golf balls when struck by the head, and/or (b) of specific gravity and/or geometric configuration selected to contribute to the desired weight distribution in the head. Several insert patterns are shown.

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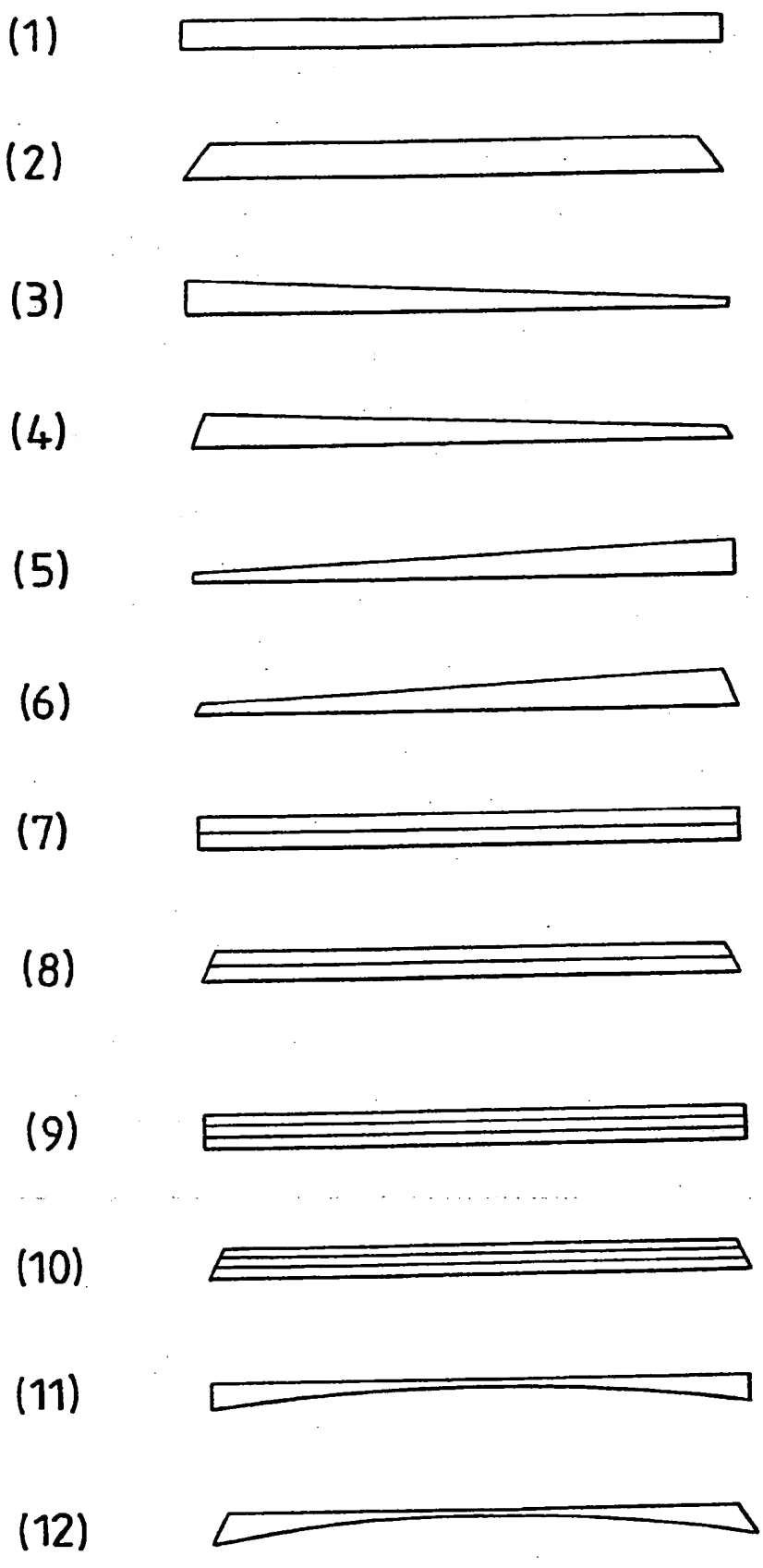


Fig. 1

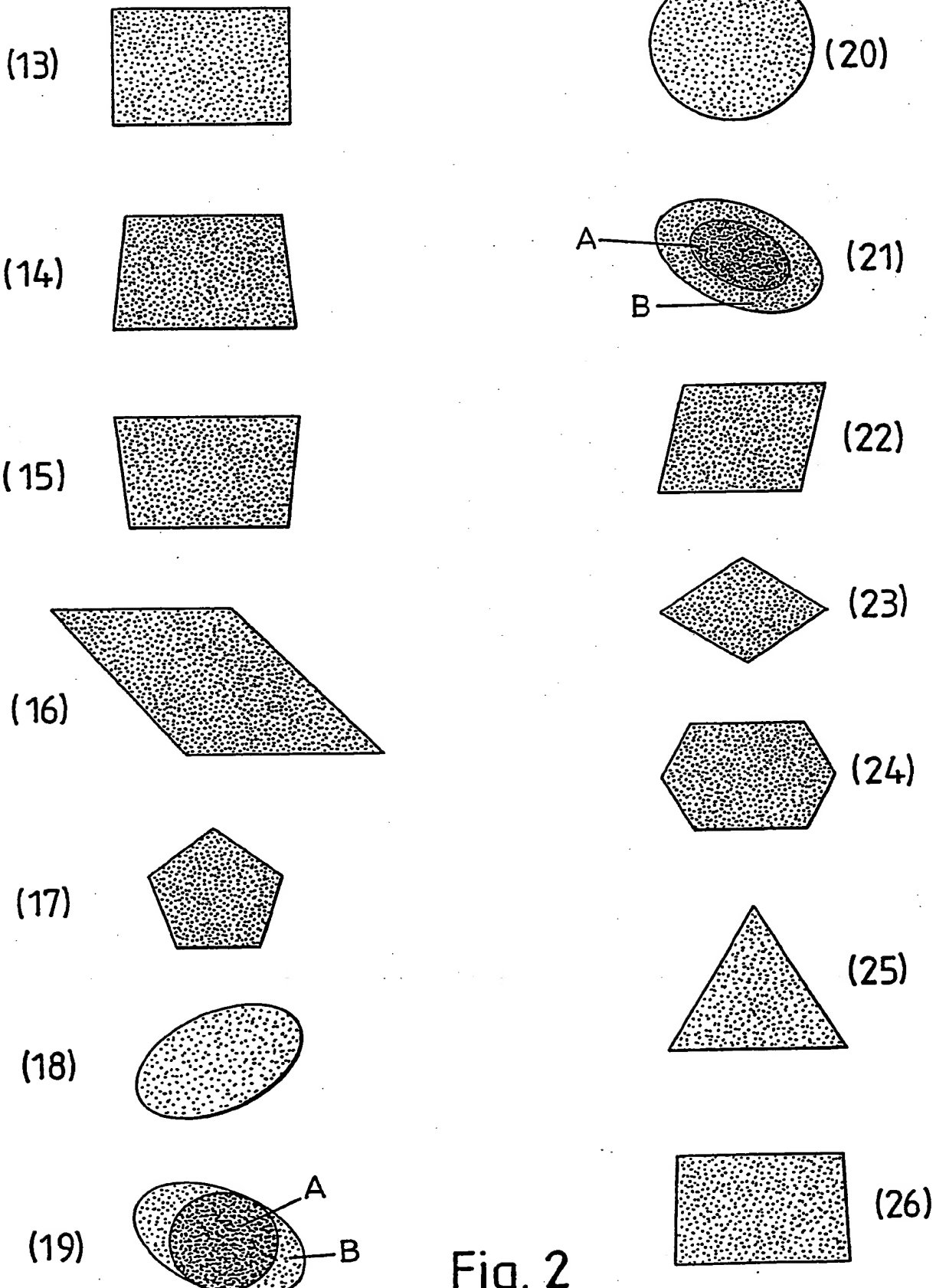


Fig. 2

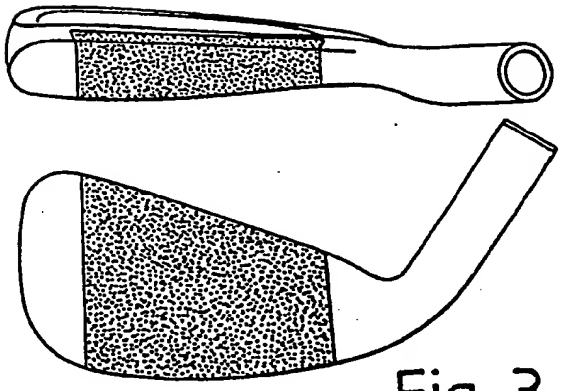


Fig. 3

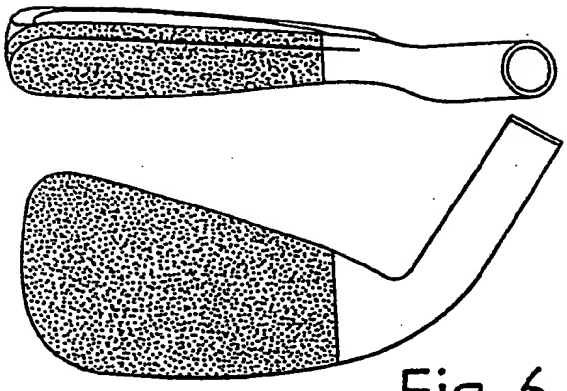
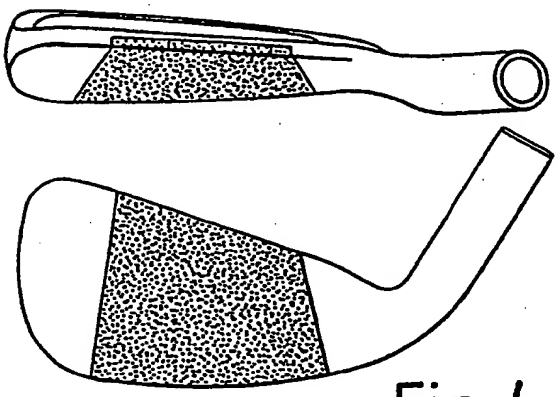


Fig. 6



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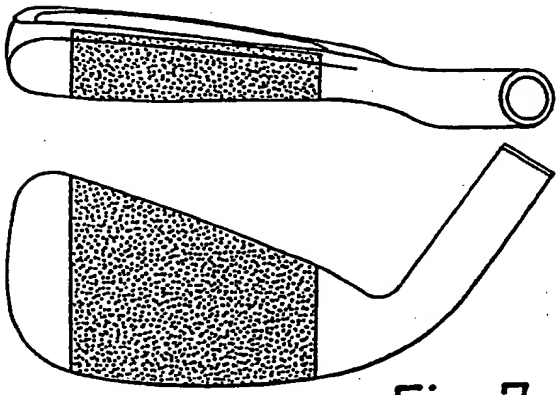


Fig. 7

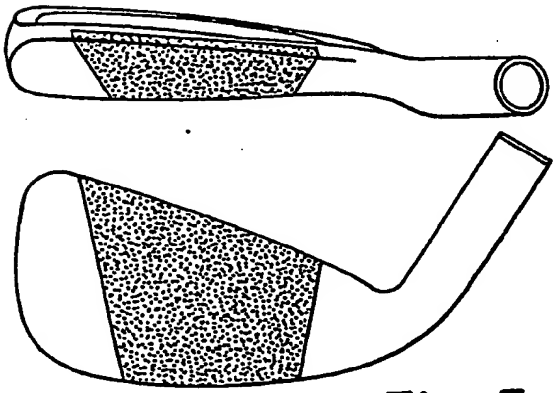


Fig. 5

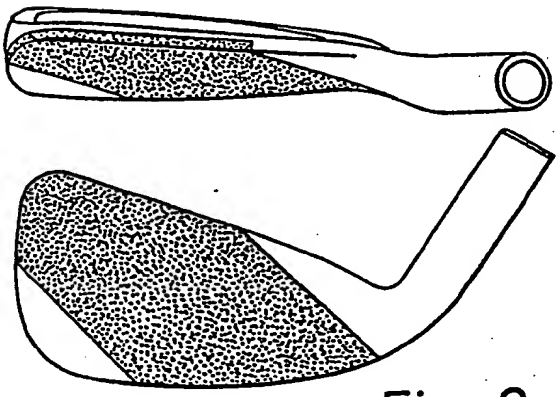


Fig. 8

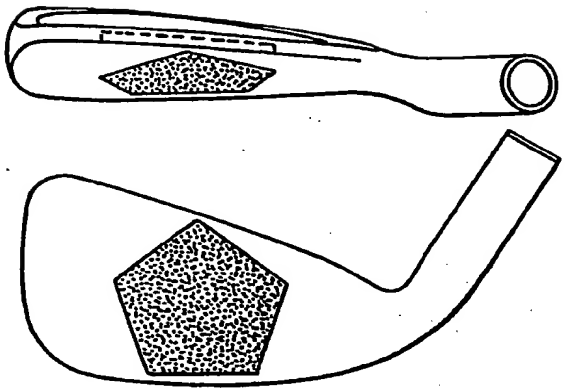


Fig. 9

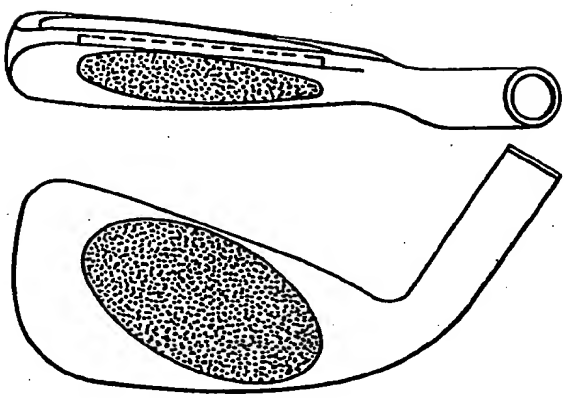
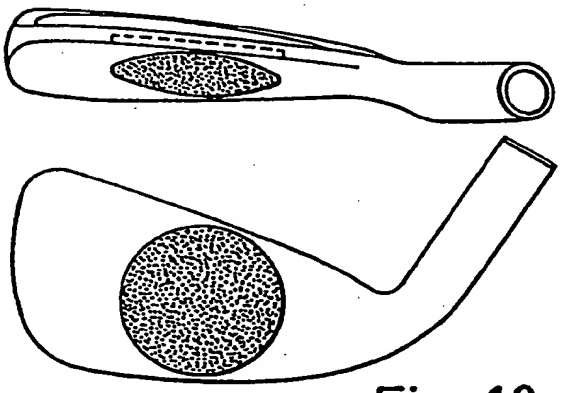


Fig. 12



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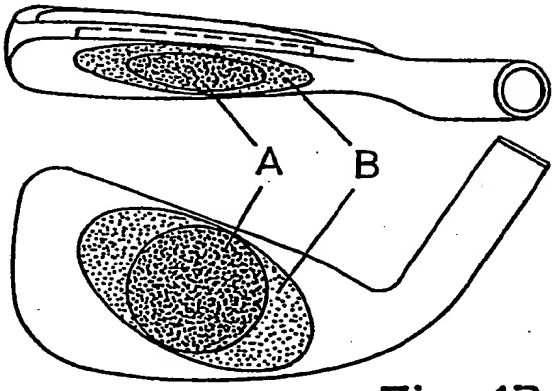
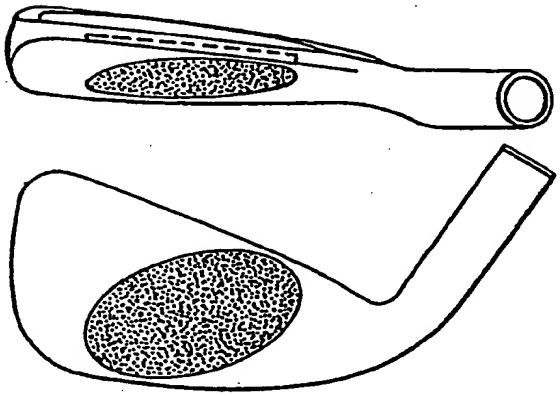


Fig. 13



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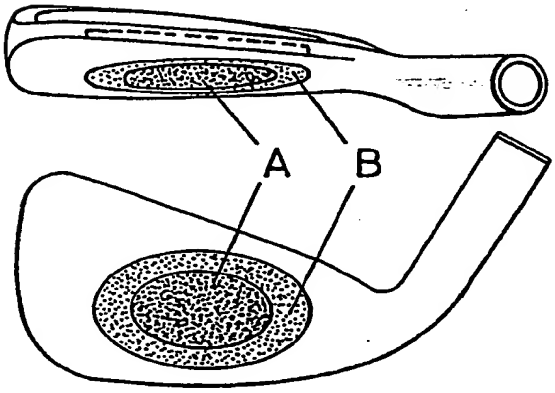

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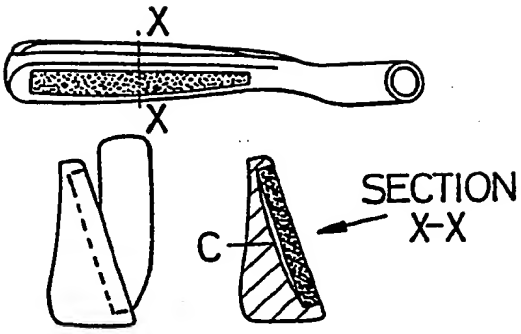

Fig. 15

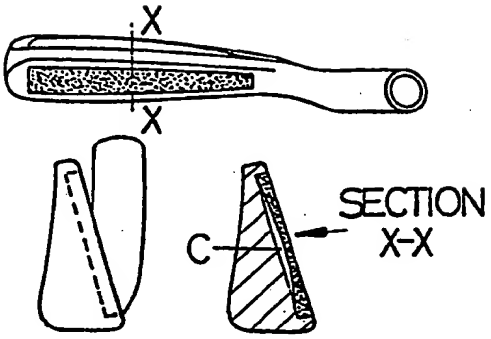

Fig. 16

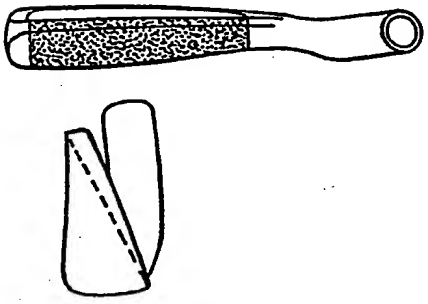

Fig. 17

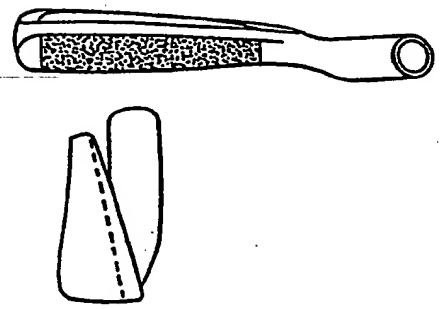

Fig. 18

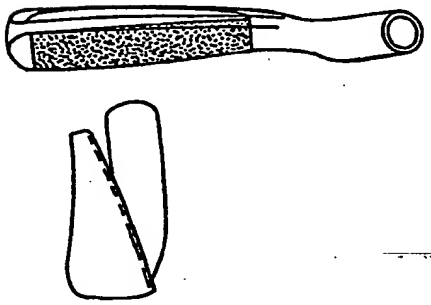

Fig. 19

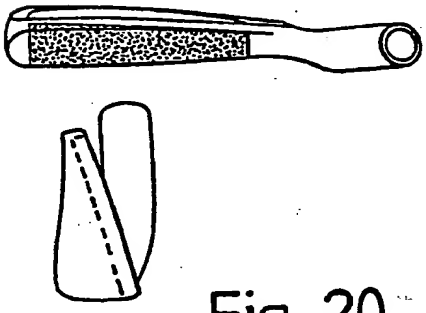

Fig. 20

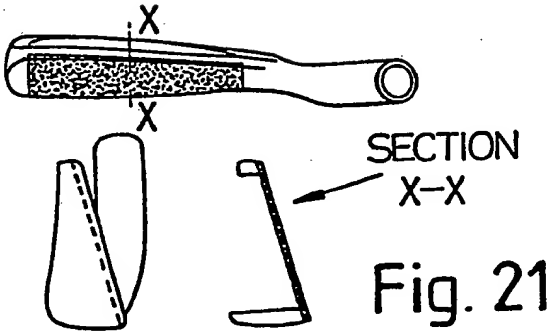

Fig. 21

GOLF CLUB HEADS

The present invention relates to the head structure of golf clubs, particularly golf irons.

There are several clubs in a set of irons, each one designed in terms of shaft length, head weight, head weight distribution, swing weight, loft and lie, to confer certain playing characteristics. An object of the present invention is to improve the performance characteristics of golf irons.

According to one general aspect of the present invention, in a set of golf iron heads, at least part of the striking face of each head is of material selected for characteristics desired for the particular iron in the set and at least some of the heads are multi-component heads in which at least part of the striking face area of the head comprises at least one face-piece component of material having at least one characteristic different to the rest of the head.

According to the present invention also there is provided a multi-component golf iron head in which at least part of the striking face area of the head comprises at least one face-piece component, said face-piece component(s) being: (a) of material selected for its surface friction and/or flexural modulus characteristics affecting the spin behaviour of golf balls when struck by the head, and/or (b) of specific gravity and/or geometric configuration selected to contribute to the desired weight distribution in the head.

When only part of the striking face comprises at least one face-piece component, normally the outer surface of the face-piece component(s) will be level with the adjacent surface of the striking face and normally the face-piece component(s) will be located at least at the normal position of impact with a golf ball by a competent golfer such as at least at the "sweet spot" area, usually the central area, of the striking face.

The head may have a main body, or core, of one or more components, and a face-piece of one or more components attached or attachable thereto.

By means of the present invention it is possible to optimise playing characteristics and, by careful selection of components, confer a range of performance attributes to suit a wide variety of golfers and playing conditions.

Some clubs are designed primarily for distance and some primarily for control. These characteristics can be enhanced by careful selection of the material(s) and geometric configurations of the face-piece.

Since the face-piece component(s) can be selected to have characteristics which are independent of the properties desired for the rest of the head, the materials of which the main body component(s) are formed may be selected from a wider range than those considered suitable for one-piece heads.

By way of example only, materials for the main body component(s) include metals e.g. steel (forged or cast, stainless or mild), metal alloys e.g. zinc/aluminium or beryllium/copper, thermoplastic or thermoset plastics or resins, carbon fibre- or other fibre-reinforced plastics, and metal matrix composites.

Materials of the face-piece component(s) may be selected to confer characteristics particularly desired for the striking face by selection of properties such as weight, friction, flexural modulus, resilience, hardness and aesthetic appearance (e.g. colour). For instance, ceramics, thermoplastics, thermosets, metals, elastomers, and particle- or fibre-reinforced composites, may be employed. Examples of reinforcing fibres for fibre-reinforced composites are those of carbon, glass, ceramics and textiles such as aramids (e g 'Kevlar'). Examples of polymer matrices of the composite are nylons, epoxy resins and polyester resins.

One important characteristic for which the present

invention is advantageous is the ability of the head to produce and/or control spin on a golf ball.

Clubs which confer high spin are desirable for the better player to enhance control and manipulability but clubs which generate low spin are desirable for poor players to improve distance and to reduce undesired hooking and slicing. For all golfers increased back-spin tends to reduce roll and increase drag, thereby reducing travel distance. This is more of a penalty for poor golfers than for good golfers.

The ability to produce and/or control spin depends significantly on the friction and flexural modulus characteristics of the head face.

A preferred embodiment of the invention is a set of multi-component golf iron heads each having one or more face-piece component(s) of low friction and flexural modulus characteristics in order to minimise spin and maximise distance and straightness.

Examples of suitable low friction face-piece component materials, embracing both low and high flexural modulus materials, are PTFE, ceramic materials, glass, metals, nylon, polycarbonate, etc. The head main body component(s) may be of materials conventionally employed for iron club heads.

Another preferred embodiment of the invention is a set of club heads with face-piece component(s) having friction and/or flexural modulus characteristics on a graduated scale, using materials of low friction and low flexural modulus for the long irons and using materials of progressively increasing friction and flexural modulus through to the shortest irons, thereby providing longest distance for the long irons and best control for the short irons.

A further important characteristic for which the present invention is advantageous is the weight distribution in the head. It is well known that the weight distribution in the head affects the tendency of the head to rotate about the shaft axis during

ball/club impact - especially when the ball/club impact occurs in a position other than the "sweet spot" i.e. the position on the face directly aligned along the swing path with the centre of rotation of the head. This rotational tendency can be influenced, i.e. either increased or decreased, by changing the weight distribution in the head. For instance, it is well known to move weight elements towards the toe and heel of the club in order to produce clubs in which this rotational tendency is reduced. Clubs which have such a reduced rotational tendency with off-centre impacts generally will hit the ball straighter than other clubs. Conversely, increasing the weight immediately behind the impact position increases this rotational tendency and such clubs generally will hit the ball less accurately for off-centre impacts. Similarly, redistributing weight in the vertical plane also affects club performance. Moving weight elements towards the sole of the club lowers the centre of gravity of the head which in turn tends to increase ball trajectory for any given impact position on the face.

The present invention enables a greater latitude in weight distribution and geometry of a golf club head by selection of face-piece materials and main body materials having selected specific gravities.

According to one preferred embodiment of the invention there is provided a multi-component golf club head having a face-piece component of specific gravity lower than that of the main body, thereby providing additional weight for redistribution to the heel and/or toe and/or sole portions of the head and thus improving the accuracy and playability of the club.

Use of such a face-piece component also permits design of a golf club head having the benefits of a cavity back head design (i.e. heel/toe/sole weight distribution) but with a more traditional blade shape.

According to another preferred embodiment of the invention there is provided a set of club heads wherein the specific gravity of the face-piece components increases from the long irons to the short irons.

The face-piece materials and geometric configurations may be selected on the basis of either or both frictional and weight distribution characteristics.

The face-piece component(s) can have a geometric configuration designed to enhance specific performance. For instance, the face-piece component(s) may have thickness variation in the vertical plane (i.e. in the top edge to sole direction) and/or in the lateral plane (i.e. in the heel to toe direction) in order to influence weight distribution and, in the case of face-piece materials which have relatively low flexural modulus under impact, relative hardness, feel and spin may also be adjusted by alteration of the face-piece geometry.

Employment of a face-piece component having a specific gravity less than that of the main body component(s) and having a vertical or lateral thickness variation is especially useful to facilitate weight distribution in the head.

A low specific gravity face-piece component having a thickness which increases in the toe to heel direction provides main body mass for distribution in the toe of the head, and conversely such a face-piece having a thickness which increases in the heel to toe direction provides main body mass for distribution in the heel of the head. Accordingly, in a set of irons heads, the centre of gravity of a head can be located nearer the toe for the long irons and progressively nearer the heel for the short irons.

A low specific gravity face-piece component having a thickness which decreases in the top edge

to sole direction provides main body mass for distribution in the sole, thereby providing a head with a low centre of gravity which tends to confer a high launch angle to balls struck by the iron and consequently usually a high ball trajectory. Conversely, such a face-piece component having a thickness which increases in the top edge to sole direction provides main body mass for distribution in the top edge, thereby providing a head with a high centre of gravity which tends to confer a low launch angle to balls struck by the iron and consequently usually a lower ball trajectory. It will be appreciated that the trajectory of a ball also depends on the spin imparted to the ball. However, generally heads having a low centre of gravity are more suitable for inexperienced golfers and heads having a high centre of gravity are more suitable for experienced golfers. The present invention provides a means of 'fine tuning' iron heads to suit the ability of a golfer by selection of face-piece component thickness gradation and complementary main body weight distribution to provide appropriate centres of gravity of the heads.

If desired, a face-piece component may have a multi-layered construction in order to generate specific combinations of weight, hardness and frictional characteristics.

The face-piece component(s) may be attached to the main body by various secure means, for instance by bonding (adhesive- or melt-bonding, welding, soldering, brazing), by securing means such as screws, bolts or rivets, and/or by mechanically interlocking complementary formations on the components.

The face-piece component(s) may be attached to the main body such that the rear surface of the face-piece is flush with the main body or such that there is a cavity between the rear surface and the main body or such that at least part of the rear surface is exposed at the back of the head.

The face-piece component(s) may be designed to be detachable to enable replacement of damaged or worn components or to change the playing characteristics of the club.

The aforementioned features of the invention may appear either singly or in combination. For instance, there may be a set of irons having face-piece components graded in friction characteristics and weight characteristics with distinctive colours in each iron, to generate optimisation in spin, accuracy and distance for each club and to facilitate identification.

It will be understood from the above description that golf clubs having a wide variety of performance, appearance and feel characteristics may be obtained by means of the present invention.

The invention is illustrated, by way of example only, in the accompanying drawings in which:-

Figure 1 shows twelve examples, numbered (1)-(12), of face-piece components in accordance with the invention, each of the examples being shown as a top plan view shape cross-section. Examples (7)-(10) are examples of components having a multi-layered, laminate, construction.

Figure 2 shows fourteen examples, numbered (13)-(26), of face-piece components in accordance with the invention, each of the examples being shown as a front elevation shape. Examples (19) and (21) are examples of multi-component face-pieces comprising two components A and B.

Figures 3 to 21 show examples of golf iron heads of nominal conventional shape comprising face-piece components in accordance with the invention. The face-piece components are shown as the shaded parts of the Figures. Figures 3 to 14 each shows the top plan and front elevation views of a head. Figures 15 to 21 each shows the top plan and toe end views of a head, with the face-piece thickness shape nearest

the toe end being depicted by the distance between the discontinuous line and the face line on the toe end view. Figures 15, 16 and 21 additionally show a cross-section of the head at X-X of the plan view. Some features exemplified by Figures 3 to 21 are as follows:-

In Figure 3, the face-piece component has lateral edges which are substantially parallel at the head face and which diverge rearwardly to provide a dovetail mortise joint with a complementary formation in the main body of the head.

In Figure 4, the face-piece component has lateral edges which are divergent from the top edge to the sole of the head.

In Figure 5, the face-piece component has lateral edges which are divergent from the sole to the top edge of the head.

In Figure 6, the face-piece component extends completely to the toe of the head, as well as to the top edge and sole of the head, and substantially completely covers the face of the head.

In Figure 7, the face-piece component has the same face shape as that of Figure 3 but does not diverge rearwardly.

In Figure 8, the face-piece component has substantially parallel lateral edges at an angle of about 45° to the centre line of the face.

In Figure 9, the face-piece component has a polyhedral face shape, exemplified by a regular pentahedron, positioned centrally of the face of the head.

In Figure 10, the face-piece component has a circular face shape positioned centrally of the face of the head.

In Figure 11, the face-piece component has an elliptical face shape with its greatest diameter inclined from high at the heel side to low at the toe side.

In Figure 12, the face-piece component has an elliptical face shape with its greatest diameter inclined from low at the heel side to high at the toe side.

In Figure 13, the head has a multi-component face-piece comprising a circular inner component A and an inclined elliptical outer component B.

In Figure 14, the head has a multi-component face-piece comprising an elliptical inner component A and an elliptical outer component B.

In Figure 15, the head has a closed cavity or hollow C between the rear uniplanar surface of the face-piece component and a concave surface of the body of the head.

In Figure 16, the face-piece component has a concave rear surface and the head has a closed cavity C bounded by the rear surface of the face-piece component and the surface of the body of the head.

In Figure 17, the face-piece component has a thickness which increases in the direction from the sole to the top edge of the head.

In Figure 18, the face-piece component has a thickness which decreases in the direction from the sole to the top edge of the head.

In Figure 19, the face-piece component has a thickness which decreases in the direction from the heel to the toe of the head.

In Figure 20, the face-piece component has a thickness which increases in the direction from the heel to the toe of the head.

In Figure 21, the head has a face-piece component which provides also at least part of the surface of the back of the head, such as at least part of the surface of an open cavity at the back of the head as shown diagrammatically by the section X-X.

The accompanying drawings merely show some examples of face-piece components and golf club heads in accordance with the invention and it will be

appreciated that there is a multitude of additional variations of shape and construction of face-piece components and golf club heads within the scope of the invention as defined herein.

CLAIMS:

1. In a set of golf iron heads, at least part of the striking face of each head is of material selected for characteristics desired for the particular iron in the set and at least some of the heads are multi-component heads in which at least part of the striking face area of the head comprises at least one face-piece component of material having at least one characteristic different to the rest of the head.

2. A set of golf iron heads according to Claim 1 wherein the one or more face-piece components are selected to provide friction and/or flexural modulus characteristics on a graduated scale through the set, the friction and/or flexural modulus of the face-piece component material being lowest for the long-distance irons and highest for the short-distance irons.

3. A set of golf iron heads according to Claim 1 or 2 comprising heads having a face-piece component whose specific gravity increases through the set from the long-distance irons to the short-distance irons.

4. A set of golf iron heads according to any of the preceding Claims comprising heads having a face-piece component of specific gravity lower than that of the rest of the head and wherein the thickness of the face-piece component increases in the toe to heel direction of the head for at least one of the long-distance irons and increases in the heel to toe direction of the head for at least one of the short-distance irons.

5. A set of golf iron heads according to Claim 1 and substantially as described herein.

6. A multi-component golf iron head in which at least part of the striking face area of the head comprises at least one face-piece component, said face-piece component(s) being: (a) of material selected for its surface friction and/or flexural modulus characteristics affecting the spin behaviour of golf balls when struck by the head, and/or (b) of specific

gravity and/or geometric configuration selected to contribute to the desired weight distribution in the head.

7. A golf iron head according to Claim 6 comprising a face-piece component of material having a specific gravity lower than that of the rest of the head.

8. A golf iron head according to Claim 6 or 7 comprising a face-piece component having a thickness which increases or decreases in the top edge to sole direction of the head.

9. A golf iron head according to any of Claims 6 to 8 comprising a face-piece component having a thickness which increases or decreases in the heel to toe direction of the head.

10. A golf iron head according to any of Claims 6 to 9 comprising a face-piece component having a multi-layered construction.

11. A golf iron head according to any of Claims 6 to 10 comprising a face-piece component attached to the main body by secure means including mechanically interlocking complementary formations.

12. A golf iron head according to any of Claims 6 to 11 comprising a face-piece component attached to the main body in a manner to be detachable therefrom when required.

13. A golf iron head according to Claim 6 having one or more face-piece components substantially as described herein with reference to or as shown in any of the accompanying drawings.

14. A golf iron head according to Claim 6 substantially as described herein with reference to or as shown in any of Figures 3 to 21 of the accompanying drawings.

15. A golf iron head according to Claim 6 and substantially as described herein.

16. A golf iron head according to any of Claims 6 to 15 in a set of golf iron heads.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) A6D (D23B)

5 A63B 53/04

(ii) Int Cl (Edition)

Search Examiner
D WHITFIELD

Databases (see over)

(i) UK Patent Office

ONLINE DATABASES: WPI

(ii)

Date of Search
28 OCTOBER 1992

1 TO 5

Documents considered relevant following a search in respect of claims

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2181657 A (MARUMAN) whole document	1, 2
X	GB 2132902 A (YONEX) whole document	1
X	US 5004242 (SUMIMOTO) whole document	1
X	US 4809978 (SUMIMOTO) whole document	1
X	US 4768787 (SHIRA) whole document	1
X	US 4754975 (AIZAWA) whole document	1
X	US 4664383 (AIZAWA) whole document	1

Category	Identity of document and relevant passages	Relevant to claim(s.

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